Sourcing trends in the car industry

A survey of car manufacturers’ and suppliers’ strategies and relations

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Abstract  Intense competition and structural changes characterize the car industry. Several trends (i.e. general changes over time) concerning sourcing strategies and supplier relations can therefore be identified. The article aims to analyze how these trends correspond to the actual situation in the car industry. Based on a survey answered by both car manufacturers and first tier suppliers, this article provides facts and analyses regarding sourcing-related trends over the past decade as well as some future predictions. The results show that both car manufacturers and suppliers continue to reduce product development time. They also increase supplier involvement in product development and the share of inbound JIT-deliveries. However, while suppliers increase their outsourcing and globalization of production and product development activities, car manufacturers do not. Only some of the identified sourcing-related trends are actually supported by the presented results. Hence, this article modulates the picture of the current development within the car industry.

Introduction
Restructuring and change have characterized the car industry in the past decade. Over-capacity, increasing customer requirements, tougher environmental legislation and rapid technology development are among the most important factors behind this development. To stay competitive, car manufacturers and suppliers therefore continuously need to improve their performance (see McIvor et al., 1998) regarding production (e.g. delivery precision, quality, cost) and product development (e.g. time, cost, innovativeness). As a consequence, several trends (here defined as general changes over time within the industry) concerning sourcing strategies and supplier relations can be identified. In this first part of the article, important trends are identified based on available research and literature and then, in the following sections, these trends are analyzed further by comparisons with empirical data.

Regarding the car industry as a whole, there is an evident change towards more global operations (Sturgeon, 1999; Ghemawat and Ghadar, 2000). With a global presence, car manufacturers and suppliers may, for instance, increase their production volumes and thereby benefit from economies of scale. Several car manufacturers have therefore recently merged with or acquired other car manufacturers. The merger between Daimler and Chrysler, Ford’s acquisitions of Volvo and Jaguar, and GM’s acquisition of Saab are only a few examples.
The same applies to suppliers where a few actors (e.g. Delphi and Lear Corporation) have become dominant players mainly through acquisitions of smaller suppliers (Lewis and Wright, 1999; McIvor et al., 1998).

Also the vertical relations, i.e. between car manufacturers and suppliers, have changed in the past decades. For instance, several researchers have referred to the trend of increasing outsourcing (see e.g. Mercer, 1995; McIvor et al., 1998). By outsourcing certain activities to specialized suppliers, companies can focus on those products and activities that they are distinctively good at (Venkatesan, 1992). This specialization, enabling a reduction of the capital base, implies improved return on invested capital (Quinn and Hilmer, 1994) and possibilities to benefit from economies of scale. However, outsourcing means that important activities are placed outside the boundaries of the firm (Richardson, 1972). Hence, extended co-operation between car manufacturers and suppliers is needed to ensure efficient co-ordination of these activities (Dubois, 1994). However, co-ordination of activities demands vast resources, and many companies therefore strive to reduce their supply bases (Cousins, 1999), i.e. the number of suppliers to the company.

When it comes to products, the most important drivers for changes are decreasing product life cycles and increasing product customization and variety (see e.g. Bullinger, 1993; Hartley, 1998; Pine, 1993; Åhlström and Westbrook, 1999). Shorter product life-cycles demand cost reductions, reduced development time and faster production ramp-ups (see e.g. Lamming, 1993; Almgren, 1999). At the same time, product customization complicates cost efficiency since the volume per product variant is reduced. To handle this problem, car manufacturers increasingly use product platforms and modularization. By using a global platform for several product models, production volume may be increased, at the same time as product variants can be created by modifications of modules (see e.g. Ulrich and Tung, 1991; Baldwin and Clark, 1997). An illustrative example is Volkswagen’s group-wide product platforms (see Wilhelm, 1997).

The use of modules for product customization will have implications for the manufacture and assembly of products. Although the basic modules are the same, creating a large number of variants makes it difficult and costly to keep all of them in stock. The use of sequenced just-in-time deliveries from module suppliers has therefore become more frequent (see Mercer, 1995). Short delivery time then becomes an important criterion which, in turn, demands that suppliers are located close to the customers’ assembly plants (Millington et al., 1998). For example, many suppliers have established local assembly units in supplier parks. There, product modules are customized and then delivered just-in-sequence to the car manufacturer’s assembly line. This demand on proximity in module supply is another important factor behind the globalization of suppliers’ production activities (Helper et al., 1999).

Also product development has been affected by the changing conditions within the car industry. For example, as stated above, shorter product life cycles demand shorter development time. Further, outsourcing and
(organizational) specialization, in combination with modularization, have created new conditions for product development. Supplier involvement in product development is, for instance, made easier when products are split into modules (see e.g. Fine and Whitney, 1996). By involving suppliers in product development, customer firms may take advantage of the suppliers’ knowledge regarding product development and production. Thereby, development time and cost may be reduced (Clark, 1989). Supplier involvement has therefore attracted an increasing interest over the past decade (see e.g. Wynstra et al., 1999). However, supplier involvement is a complex task, implying that companies become more dependent on their suppliers (Nishiguchi, 1994). As a consequence, closer relationships are needed and car manufacturers have to focus their resources on a few strategically important suppliers (Kamath and Liker, 1994). This is a factor explaining the supply base reduction mentioned above.

Taken together, there is no doubt that the car industry is going through a period of change and restructuring. To summarize the sourcing-related trends outlined above, eight proposals have been formulated in Table I.

The identified trends are often referred to among practitioners, in the media and by researchers. It is, however, difficult to find references providing hard facts supporting (or rejecting) these trends. Many authors in fact routinely refer to these sourcing trends, which implies a risk that they become “stylized facts” that are not critically reviewed. Hence, there is a need for a more comprehensive, and critical, review of these sourcing-related trends. This article aims at providing quantitative data regarding the outlined sourcing-related trends and, further, to compare these results with existing research. The aim is also to investigate whether there are differences between car manufacturers and first tier suppliers. Further, it can be assumed that relationships exist between some of the identified trends.

The remainder of the article is structured as follows. In the next section, the research method is outlined and explained. Then, the results are presented, analyzed and discussed. Finally, conclusions are drawn and suggestions for further research are given.

<table>
<thead>
<tr>
<th>Proposal (trend)</th>
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<tbody>
<tr>
<td>P1  Increasing importance of key performance criteria (e.g. delivery precision, quality, cost)</td>
</tr>
<tr>
<td>P2  Product life-cycles become shorter</td>
</tr>
<tr>
<td>P3  Production and product development activities become more globalized</td>
</tr>
<tr>
<td>P4  Outsourcing is increasing</td>
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<td>P5  Companies reduce their supply base</td>
</tr>
<tr>
<td>P6  Product development time is decreasing</td>
</tr>
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<td>P7  Suppliers account for an increasing share of product development resources</td>
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<tr>
<td>P8  Use of JIT-deliveries is increasing</td>
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</tbody>
</table>

Table I. Proposals regarding current trends in the car industry (based on the literature review)
**Research method**

The empirical research in this article is based on a survey of car manufacturers and first tier suppliers. In order to enable comparisons between these two categories, they were given identical questionnaires. The questions were formulated in a way that would enable investigation of the proposals shown in Table I. However, the referred proposals and trends were not explicitly addressed in order to avoid some bias due to “stylized facts”. To enable an analysis of the development over time, the respondents were asked to provide estimates regarding the years 1988, 1998 and 2003, respectively. The study was performed during 1999, implying that the most recent company data available would be from 1998. Further, it was assumed that, during the ten-year period between 1988 and 1998, most companies participating in the study would have introduced new models. Thereby, they would also have had opportunities to fundamentally change their operations. To go ten years back in time was also considered to be enough to capture some of the “pre-lean” conditions (in the West). Ten years was, however, considered to be too long a time for predictions about the future. Five years from 1998, resulting in predictions concerning the year 2003, was assumed to be a reasonable time. Further, to enable the respondents to use company records and forecasts as a basis for their answers, the questions were mainly of a quantitative nature (i.e. company figures and Likert-scales).

Several companies, especially among the suppliers, may have activities outside the automotive sector. All companies were therefore asked to provide data concerning their automotive business only. Further, all companies were asked to answer the questions with regard to their own situation and their own products. However, the issue concerning division of product development resources (between car manufacturers, first and second tier suppliers respectively) was an exception since all companies were asked to answer exactly the same question. Further, comparisons between car manufacturers and suppliers need to be examined carefully since there is a risk that they perceive exactly the same phenomenon in different ways. This risk is, however, assumed to be less pronounced here. Because, when all respondents answered exactly the same question regarding product development resources, no significant differences were found between car manufacturers and suppliers.

The sample of companies originates from Automotive News Europe (1998, 1999) where the largest (in terms of turnover) car manufacturers and first tier suppliers were listed. Small car manufacturers with low volumes (e.g. Morgan and Rolls-Royce) were not added to the sample since the characteristics of their operations differ greatly from high volume manufacturers’ operations. Among first tier suppliers, large companies were assumed to have most influence over the car manufacturers’ operations (providing a large share of the purchased value). These companies were also assumed to have more influence over the supplier structure as a whole than smaller suppliers have. These lists were therefore regarded to be a useful basis for the study. In total, the sample included 32 car manufacturers and 92 first tier suppliers. In most cases where
one company owns several different car manufacturers or brands (for example, Audi, Skoda and Seat that are all owned by Volkswagen), the survey was sent to each of these manufacturers.

In March 1999 the survey was mailed to purchasing, development and company executives. Unless the companies declined participation, several reminders were sent to those who did not answer the questionnaire. In November 1999, when the data collection phase was ended, 27 companies had answered the survey. This gives a response rate of 21.8 per cent. The limited sample size will, however, have implications for the possibilities to draw conclusions from the data. It is important to note that larger differences between groups can be found, while the possibilities of detecting smaller differences are limited (see Verma and Goodale, 1995). In other words, differences that do exist (e.g. between car manufacturers and suppliers), but are small, may not be detected because of the limited sample size.

A total of 11 car manufacturers and 16 first tier suppliers, (see Table II) answered the questionnaire. A majority of the answers are from Europe, but also North American and Asian companies are represented in the study. The number of responses does not enable comparisons between countries. However, the bias towards European companies called for a check for regional differences. No significant differences were found, except among first tier suppliers regarding the division of product development resources. This is further discussed in the following section. Furthermore, both small and large car manufacturers are represented in each geographical category. The same applies to the suppliers with a yearly turnover ranging from $500 million to $6 billion. Hence, both small and large companies are represented, although the very largest “mega suppliers” did not participate in the study. The suppliers that responded are active within areas such as interior, exterior, chassis, engine and transmission, thereby covering the technology areas represented by the suppliers in the original sample.

The analyses of the data have mainly been focused on similarities (or differences) and correlations. Histogram plots showed, however, that most variables were not normally distributed. Moreover, the number of responses implies that the variables can be regarded as discrete (especially when using sub-groups of data). Therefore, parametric tests like the $t$-test could not be used. Instead, the non-parametric Mann-Whitney’s test was used for independent variables and Wilcoxon’s test for dependent variables (e.g. comparisons between different years). Correspondingly, for the correlation analyses, the Pearson-correlation was replaced with Spearman. The chosen

<table>
<thead>
<tr>
<th></th>
<th>North American</th>
<th>European</th>
<th>Asian</th>
<th>Total</th>
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<tbody>
<tr>
<td>Car manufacturers</td>
<td>2</td>
<td>7</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>First tier suppliers</td>
<td>4</td>
<td>9</td>
<td>3</td>
<td>16</td>
</tr>
</tbody>
</table>

Table II. Distribution of responses based on the companies’ nationalities
methods are more conservative than the \( t \)-test and the Pearson-correlation, which means that the analyses of the data have been relatively more restrictive.

All research designs have their limitations, the one used here being no exception. As described above, however, precautions have been taken to interpret data in a careful and conservative manner. The results presented in this article should be seen in the light of the general scarcity of fact-based evidence regarding current trends in the car industry. So, even though the number of responding companies in the data sample is limited, the results can help to further develop the picture.

**Results**

This section presents the results of the survey investigating sourcing trends in the car industry. The section is structured according to the eight proposals presented in the introduction. In addition, correlations between some specific variables are tested. Explanations and discussions of the results are presented in the following section:

**P1. Increasing importance of key performance criteria.**

As a consequence of overcapacity, intense technology development and increasing (and diverging) customer requirements, the first proposal (P1) stated that the importance of key performance criteria is increasing. To assess how the car manufacturers and suppliers actually perceive different criteria, they were asked to specify the importance of eight performance criteria for their company’s competitive strength in 1988, 1998 and 2003. The results are shown in Table III.

When considering the car manufacturers’ and suppliers’ responses taken together (not shown in Table III), all performance criteria were expected to be more important in 2003 than in 1988. Furthermore, all criteria but product cost increased in importance between 1998 and 2003. It is the car manufacturers that do not expect product cost to be more important in 2003 than in 1998.

<table>
<thead>
<tr>
<th></th>
<th>Car manufacturers</th>
<th>Suppliers</th>
</tr>
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<tbody>
<tr>
<td>Delivery precision</td>
<td>3.0 ** 4.0 * 4.4</td>
<td>3.2 ** 4.3 ** 4.9</td>
</tr>
<tr>
<td>Quality</td>
<td>3.5 * 4.7 5.0 4.2</td>
<td>4.6 * 4.8</td>
</tr>
<tr>
<td>Product cost</td>
<td>3.6 4.5 4.6 3.9 ** 4.9 *</td>
<td>4.7</td>
</tr>
<tr>
<td>Customized products</td>
<td>2.4 * 3.5 * 4.1 3.2 3.7</td>
<td>4.1</td>
</tr>
<tr>
<td>Product related services</td>
<td>2.5 * 3.5 * 4.2 2.2 ** 3.3 ** 4.1</td>
<td></td>
</tr>
<tr>
<td>Development time</td>
<td>3.2 * 4.1 4.4 3.1 ** 4.1 * 4.6</td>
<td></td>
</tr>
<tr>
<td>Development cost</td>
<td>3.3 * 4.0 4.3 3.1 ** 4.0 ** 4.4</td>
<td></td>
</tr>
<tr>
<td>Product innovation</td>
<td>3.0 * 3.9 4.2 3.2 ** 4.3 * 4.7</td>
<td></td>
</tr>
</tbody>
</table>

**Table III.**


**Notes:**

* Significant increase between 1988-1998 or 1998-2000 = \( p < 5 \) per cent;
** significant increase between 1988-1998 or 1998-2000 = \( p < 1 \) per cent

Scale from 1 = not important to 5 = very important
Moreover, product cost is the only criterion that the car manufacturers did not regard as more important in 1998 compared to 1988. In fact, the car manufacturers only expect delivery precision, customized products and product related services to become increasingly important between 1988 and 2003. These three criteria also showed the largest significant increase during this period of time. Suppliers, on the other hand, consider more performance criteria to be increasingly important. As seen in Table III, customized products is the only criterion that suppliers do not expect to be more important in 2003 than in 1998, while both customized products and quality were seen as equally important in 1998 as in 1988. Considering the relatively high rankings in Table III, however, it is clear that most performance criteria are regarded as important for a majority of the companies:

\[P2\]. Product life cycles become shorter.

It was argued in the introduction that product life cycles become shorter. This was also stated in the second proposal. To assess if this really is the case, the car manufacturers and first tier suppliers were asked to estimate the average life-cycle lengths for own products introduced in 1988, 1998 and 2003. The results are shown in Table IV.

The results show that both car manufacturers and suppliers expect a shorter life cycle for a product introduced in 1998 compared to one introduced in 1988. However, only suppliers expect to reduce product life cycles even further until 2003. For 1988 and 1998, there were no significant differences between car manufacturers and suppliers regarding product life cycles. In 2003, however, the suppliers’ expected product life cycles are significantly shorter than the car manufacturers’.

\[P3\]. Production and product development activities become more globalized.

Globalization has here been measured as geographical dispersion of production and product development activities. To test if globalization is increasing, as suggested by the third proposal (\[P3\]), the respondents were asked to estimate the number of countries in which they have, or will have, production and product development activities in 1988, 1998 and 2003. The results are shown in Table V.

<table>
<thead>
<tr>
<th></th>
<th>1988</th>
<th>1998</th>
<th>2003&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
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<tbody>
<tr>
<td>Car manufacturers&lt;sup&gt;a&lt;/sup&gt;</td>
<td>7.4</td>
<td>5.8</td>
<td>5.7</td>
</tr>
<tr>
<td>Suppliers&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.5</td>
<td>5.0</td>
<td>4.1</td>
</tr>
</tbody>
</table>

**Notes:**

<sup>a</sup> Significant difference between 1988-1998 (\(p < 5\) per cent)

<sup>b</sup> Significant difference between 1988-1998 and 1998-2003 (\(p < 1\) per cent)

<sup>c</sup> Significant difference between car manufacturers and suppliers (\(p < 1\) per cent)
The results clearly show that the car manufacturers are not changing their geographical dispersion of production or product development activities. The suppliers have, on the other hand, significantly increased the number of countries in which they undertake these activities (see Table V). On average, they actually expect to almost triple the number of countries where they have production activities and more than double the number for product development.

**P4. Outsourcing is increasing.**

Organizational specialization was referred to in the introduction as one way for companies to respond to increasing competition. It was, therefore, proposed that the degree of outsourcing is increasing (P4). To assess whether this is really the case, the respondents were asked to estimate the cost of purchased materials as share of total turnover. The results are shown in Table VI.

Somewhat surprisingly, the results show that the car manufacturers have not significantly increased their degree of outsourcing, and do not intend to do so. Neither did the suppliers increase their cost of purchased materials as share of turnover between 1988 and 1998. However, they expect a significant increase between 1998 and 2003. The results in Table VI also show that there are significant differences between the car manufacturers’ and suppliers’ degrees of outsourcing. The car manufacturers thus outsource more than suppliers in terms of purchased materials in relation to turnover, but the suppliers intend to increase their share.

**P5. Companies reduce their supply bases.**

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<tbody>
<tr>
<td>Production</td>
<td>14.9</td>
<td>15.7</td>
<td>15.9</td>
<td>2.6</td>
<td>2.1</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Product development</td>
<td>2.6</td>
<td>5.0</td>
<td>5.9</td>
<td></td>
<td></td>
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</table>

**Note:**

aSignificant increase between 1988-1998-2003 for production (p < 1 per cent)
and for product development (p < 5 per cent)

| Car manufacturers | 61.7 | 63.7 | 65.7 |
| Suppliers a       | 41.6 | 46.4 | 50.6 |

**Notes:**

aSignificant difference between 1998-2003 (p < 1 per cent)
bSignificant difference between car manufacturers and suppliers (p < 5 per cent)
cSignificant difference between car manufacturers and suppliers (p < 1 per cent)
By reducing the number of suppliers, companies can invest more resources in improving their relationships with the remaining suppliers. It was therefore proposed that companies are reducing their supply bases (P5). Table VII shows how the respondents estimated the change in number of suppliers to their companies between 1988 and 1998 and between 1998 and 2003 respectively.

The results in Table VII show that the car manufacturers have, on average, reduced the number of suppliers by one quarter between 1988 and 1998. Over the same period of time, the first tier suppliers actually increased their supply bases by on average 18 per cent. However, between 1998 and 2003, both car manufacturers and suppliers expect to reduce their number of suppliers.

**Correlations between product life cycle, outsourcing and supply base**

So far, the results have shown that the car manufacturers and first tier suppliers expect different product life-cycle length, degree of outsourcing and supply bases. In the following, correlations between these variables are tested.

It can be assumed that the companies expecting the shortest product life cycles will, to handle this challenge, have the highest degree of outsourcing. However, no significant correlations were found between length of product life cycle and degree of outsourcing. The same applies to the car manufacturers’ changes over time (1988 to 1998 and 1998 to 2003). However, the suppliers’ expected change in product life cycle length between 1998 and 2003 is negatively correlated with their expected change in degree of outsourcing (−0.623, p = 0.042). This means that the suppliers that intend to shorten their product life-cycles also plan to increase their degree of outsourcing.

The degree of outsourcing is, however, not the only measure of companies’ utilization of suppliers to improve performance. Close co-operation with a few suppliers may be a way of achieving shorter product life-cycles. The data was, therefore, tested for a relation between changes in the number of suppliers and in the length of product life-cycles. However, no significant correlations between these two variables were found.

There is also a possible relationship between the car manufacturers’ and first tier suppliers’ degrees of outsourcing and their number of suppliers, as well as between changes in these variables. In order to reduce transaction costs and improve co-operation, companies may, for instance, outsource more to fewer suppliers. Only one correlation was, however, found between changes in these variables. A negative correlation (−0.672, p = 0.047) exists between the

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<tbody>
<tr>
<td>Car manufacturers</td>
<td>−25</td>
<td>−16</td>
</tr>
<tr>
<td>Suppliersa</td>
<td>18</td>
<td>−16</td>
</tr>
</tbody>
</table>

**Notes:**
aSignificant difference between 1988-1998 and 1998-2003 (p < 5 per cent)
bSignificant difference between car manufacturers and suppliers (p < 5 per cent)
car manufacturers’ change in number of suppliers between 1988 and 1998 and their expected change in degree of outsourcing between 1998 and 2003. This means that the manufacturers that have reduced their number of suppliers intend to increase their outsourcing in the near future.

_P6. Product development time is decreasing._

To assess whether car manufacturers and suppliers are reducing their product development times, as proposed in the introduction (P6), the respondents were asked to estimate the average development time for own products introduced in 1988, 1998 and 2003. The results are shown in Table VIII.

It is clear that both car manufacturers and suppliers have shortened their average development times over the past ten years and that they expect to continue this reduction until 2003. In total, the respondents expect reductions of 45-50 per cent between 1988 and 2003. Further, the results show a significant difference in development time between car manufacturers and suppliers in 2003. On average, the suppliers then expect to have a 30 per cent shorter development time than the car manufacturers:

_P7. Suppliers account for an increasing share of product development resources._

As referred to in the introduction, it has been observed that suppliers to an increasing extent are becoming involved in the car manufacturers’ product development work. It was therefore proposed that suppliers account for an increasing share of the total development resources (P7). In order to modulate the picture further, all respondents were asked to estimate car manufacturers’, first tier suppliers’ and second tier suppliers’ share of the total product development resources in 1988, 1998 and 2003. The question, thus, concerned the general dispersion of development resources. The results are shown in Table IX.

As shown in Table IX, the car manufacturers’ share is estimated to decrease from about three-quarters in 1988 to half of the total product development resources in 2003. The suppliers are consequently increasing their share of product development resources. Both first and second tier suppliers are expected to more than double their relative shares between 1988 and 2003. On average, the car manufacturers and first tier suppliers gave almost identical

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<tr>
<td>Car manufacturers</td>
<td>4.7</td>
<td>3.3</td>
<td>2.6</td>
</tr>
<tr>
<td>Suppliers</td>
<td>3.6</td>
<td>2.5</td>
<td>1.8</td>
</tr>
</tbody>
</table>

**Notes:**

^a^ Significant changes between 1988-1998 ($p < 5$ per cent) and 1998-2003 ($p < 1$ per cent)

^b^ Significant changes between 1988-1998 ($p < 1$ per cent) and 1998-2003 ($p < 1$ per cent)

^c^ The difference between car manufacturers and suppliers is significant ($p < 5$ per cent)
answers about this division of development resources in the past and the future. Thus, no significant differences were found between the two categories.

However, a geographical comparison showed major differences between the Asian and European suppliers’ answers. Compared to the Asian suppliers, the European suppliers estimated that the first tier suppliers’ shares of product development resources were significantly larger during all the investigated years ($p < 5\text{ per cent}$). Their respective views on the car manufacturers’ shares of product development resources did also differ. The Asian suppliers estimated car manufacturers to have a significantly larger share of product development resources. Their views on the second tier suppliers’ shares were similar.

**Correlation between development time and share of development resources**

So far, it is evident that product development time has decreased and that suppliers are taking an increasing responsibility for product development. According to the arguments put forward in the introduction, there may be a relation between reduced development time and a higher degree of supplier involvement (measured as share of total product development resources).

For the analysis, the car manufacturers’ and first tier suppliers’ shares of product development were correlated with their respective development times. These analyses were done for each of the years 1988, 1998 and 2003 and for the changes between these years. The results show, however, no significant correlation between a high degree of supplier involvement in product development and a short development time. The above-suggested relation between the suppliers’ share of product development and development time is therefore not supported. There is, however, one interesting exception. The respondents’ estimations for 2003 in fact give a strong negative correlation ($-0.80$, $p = 0.006$) between the car manufacturers’ share of product development and development time. This indicates that car manufacturers that plan to do a large share of the development work in-house expect to have the shortest development times:

*P8. Use of JIT-deliveries is increasing.*

It was proposed in the introduction that companies increasingly use inbound just-in-time deliveries (*P8*). To assess the use of JIT-deliveries, the car

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<tbody>
<tr>
<td>1st tier supplier$^a$</td>
<td>17.7</td>
<td>30.6</td>
<td>38.2</td>
</tr>
<tr>
<td>2nd tier supplier$^b$</td>
<td>5.6</td>
<td>9.6</td>
<td>11.8</td>
</tr>
</tbody>
</table>

**Notes:**

$^a$Significant differences between 1988-1998-2003 ($p < 1\text{ per cent}$)

$^b$Significant differences between 1988-1998 ($p < 1\text{ per cent}$) and 1998-2003 ($p < 5\text{ per cent}$)
manufacturers and first tier suppliers were asked to estimate the share of purchased materials delivered to their companies according to JIT-principles in 1988, 1998 and 2003. The results are shown in Table X.

Table X clearly shows that both car manufacturers and suppliers will continue to increase their share of inbound JIT-deliveries. On average, the respondents expect an increase by approximately 30 per cent between 1998 and 2003. Furthermore, the results also show that car manufacturers’ and suppliers’ inbound JIT-deliveries are at a similar level.

Correlation between JIT-deliveries, number of suppliers and degree of outsourcing
In line with the arguments in the introduction, it can be assumed that the increasing use of JIT-deliveries is related to reduced supply bases, and to some extent, more outsourcing. The data was, therefore, tested for correlations between these variables.

No significant correlations were, however, found between these variables, neither for the car manufacturers nor for the first tier suppliers. The same applies to changes over the years for the first tier suppliers (1988, 1998, 2003) and for the car manufacturers between 1988 and 1998. However, a positive correlation (0.790, \( p = 0.020 \)) was found between the car manufacturers’ intentions of increasing the share of inbound JIT-deliveries and reducing the number of suppliers between 1998 and 2003. This correlation indicates that the car manufacturers expect to receive more modules and systems according to JIT-principles from fewer first tier suppliers.

Discussion of findings in relation to existing research
How, then, do these results relate to the trends proposed in the introduction? This section synthesizes the survey results and relates them to the outlined propositions. Existing research is also used for explaining and discussing the survey results, which are presented in Table XI.

The starting point for this article was that increasing competition forces companies in the car industry to improve their performance. Regarding certain key performance criteria (see \( P1 \) in Table XI), the survey results support this belief on a general level only (see Table III). The car manufacturers considered all criteria but product cost to be more important in 1998 compared to 1988, while only delivery precision, customized products and product related services

<table>
<thead>
<tr>
<th>Table X.</th>
<th>Share of purchased materials delivered according to JIT-principles in 1988, 1998 and 2003</th>
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</thead>
<tbody>
<tr>
<td>Car manufacturers(^a)</td>
<td>19</td>
</tr>
<tr>
<td>Suppliers(^b)</td>
<td>22</td>
</tr>
</tbody>
</table>

**Notes:**
\(^a\) Significant differences between 1988-1998 (\( p < 1 \) per cent) and 1998-2003 (\( p < 5 \) per cent)

\(^b\) Significant differences between 1988-1998 (\( p < 1 \) per cent) and 1998-2003 (\( p < 1 \) per cent)
are believed to be even more important in 2003. The suppliers perceived all criteria except quality and customized products to be more important in 1998 than in 1988. The latter insignificance may however be explained by the differing importance of variety in the suppliers’ products. Another explanation for the varying importance of the criteria is the dynamics among order-winning, qualifying and less important criteria, as explained by Slack et al. (1998). Based on Hill (1993), Slack et al. argue that criteria that were once order-winners turn into qualifiers as new criteria become order-winners and so forth. This dynamic indicates that the competition in the car industry is not only increasing, but also changing in nature.

Particularly interesting, is the fact that both car manufacturers and suppliers expect a significantly increasing importance of product related services. This implies that car manufacturers will take an increasing responsibility for leasing, financing, insurance, repairs etc. Already today we have seen the beginning of this development and this may fundamentally alter car manufacturers’ business strategies and operations (Wise and Baumgartner, 1999). A similar development may be outlined for suppliers of systems or modules since car manufacturers’ requirements are rapidly transferred down the supply chain.

In line with other research (see e.g. Bullinger, 1993; Lamming, 1993), the present survey results indicate that product life cycles are becoming shorter.

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<tbody>
<tr>
<td><strong>P1</strong> – Increasing importance of key performance criteria</td>
<td>Supported on a general level</td>
<td>Partially supported on a detailed level</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>P2</strong> – Product life cycles become shorter</td>
<td>Supported</td>
<td>Not supported</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>P3</strong> – Production and product development activities become more globalized</td>
<td>Not supported</td>
<td>Not supported</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>P4</strong> – Outsourcing is increasing</td>
<td>Not supported</td>
<td>Not supported</td>
<td>Not supported</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>P5</strong> – Companies reduce their supply bases</td>
<td>Supported</td>
<td>Supported</td>
<td>Not supported</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>P6</strong> – Product development time is decreasing</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>P7</strong> – Suppliers account for an increasing share of product development resources</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>P8</strong> – Use of JIT deliveries is increasing</td>
<td>Supported</td>
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</table>
Both the car manufacturers and the suppliers expect life cycles to be shorter for products introduced in 1998 compared to those introduced in 1988 (see P2 in Table XI). However, the car manufacturers do not expect life-cycles to be shorter for products introduced in 2003 compared to those introduced in 1998. A plausible explanation is that car manufacturers, due to the huge investments required for launching new products (Almgren, 1999), have reached a minimum life-cycle length. More frequent, but partial, product renewals can instead be achieved by letting suppliers upgrade their components or systems. First, tier suppliers have better conditions than their customers for exchanging existing products more frequently since they develop products in parallel and in different phases with several car manufacturers. This could be one of the reasons why suppliers expect to have significantly shorter life-cycles for their products, compared to the car manufacturers.

Globalization was outlined as one of the most influential trends in the car industry. According to the present survey results, however, car manufacturers do not disperse their production and product development activities into more countries (see P3 in Table XI). Considering the overcapacity in the industry, utilization of existing knowledge and capital intensive resources are reasonable explanations for this situation. Instead, globalization seems to be achieved through other means, e.g. through the use of global platforms that form the basis for many different car models produced in existing plants. Honda’s and Volkswagen’s global platforms are typical examples of this (Sugiura, 1990; Automotive News Europe, 2001).

Suppliers, on the other hand, do globalize their production and product development activities (see P3 in Table XI). This difference between car manufacturers and suppliers may be explained by suppliers having acquired local component suppliers in their strive to become systems and module suppliers. Geographical dispersion is also, in many cases, a consequence of the suppliers’ need of having a close relation with each customer (Dyer, 1996). One clear example here is the local assembly units that suppliers establish in supplier parks close to their customers’ final assembly plants (Sako and Warburton, 1999; Mercer, 1995), or their use of guest engineers in product development projects (Twigg and Slack, 1998). Since most suppliers have more than one customer, geographical dispersion of both production and product development activities is necessary. Thus, a decreasing difference between car manufacturers and suppliers can be seen in this respect (see Table V).

Considering the degree of outsourcing, it was found that neither the car manufacturers nor the suppliers have increased the cost of purchased materials as share of turnover between 1988 and 1998 (see P5 in Table XI). Thus the survey results do not support the general belief that the degree of outsourcing is increasing (see e.g. Mercer, 1995; McIvor et al., 1998). But why is this so? Concerning the car manufacturers, the results show that their current level of outsourcing, on average, lies above 60 per cent. If outsourcing even more, they may risk losing control over the car as a complete system, or losing competence and resources that they define as core (see Quinn and Hilmer, 1994). Although
the relative economic value of purchased materials has not increased, however, car manufacturers may still have outsourced more responsibility. Assembly of modules, for instance, accounts for a relatively small share of total materials costs while implying a major difference in the suppliers’ responsibility (Sako and Warburton, 1999). This clearly shows that the picture of the “increasing outsourcing” trend is more multifaceted than generally discussed.

Similar arguments can be used when discussing the suppliers’ constant level of outsourcing between 1988 and 1998. However, their situation is slightly different. Many suppliers have in recent years focused on horizontal growth through mergers, acquisitions and forward integration (McIvor et al., 1998). It is, therefore, likely that they have “inherited” activities that they regard as non-core. They may now instead focus on internal restructuring and therefore outsource some of their non-core activities. This explains the suppliers’ expected increase in outsourcing in the near future (see P4 in Table XI).

A related issue is the size of supply bases. Maintaining supplier relations is costly, and many companies, therefore, strive to reduce their supply bases (Cousins, 1999). This is important when considering the close relationships needed for JIT-deliveries and co-operation with suppliers in product development. The survey results show that the car manufacturers have reduced their supply bases and plan even further reductions (see P5 in Table XI). The suppliers did, on the other hand, increase their number of suppliers. It is reasonable to assume that module and systems suppliers have “inherited” component suppliers when the car manufacturers restructured their supply bases. Furthermore, suppliers’ globalization of production may also have contributed to the establishment of relations with local suppliers, e.g. for logistical reasons. According to the results of the study, however, the suppliers intend to follow the same path as the car manufacturers, and reduce their number of suppliers in the near future.

The last three propositions are fully supported by survey results (see P6-P8 in Table XI). Thereby, the trends concerning shorter product development time, suppliers’ increasing share of product development resources, and an increasing share of JIT-deliveries to both car manufacturers and first tier suppliers are confirmed. Many other researchers argue that relations between car manufacturers and suppliers are becoming closer (see e.g. Lamming, 1993; Dyer and Ouchi, 1993). These survey results, therefore, support car manufacturers’ decreasing supply bases and suppliers’ globalization. Taken together, it thus seems as if the car industry is moving towards closer relations between car manufacturers and a rather small number of suppliers that supply complete systems and modules. Through local establishments, these suppliers will develop their modules and deliver them, just-in-time, to a larger extent than today.

A final comment concerns the differences between car manufacturers and suppliers at a general level. It seems as if suppliers in some cases are lagging behind car manufacturers in the adherence to a trend. Regarding level of outsourcing (P4) and supply base reduction (P5), for instance, the results indicate that first tier suppliers undertake the same changes as car
manufacturers, but in subsequent periods. A reasonable explanation is that car manufacturers have adopted principles that then extend upwards in the supply chain. Such dispersion of working principles is greatly enhanced in closely integrated supply chains. While suppliers are seen as an increasingly important source of product and process innovations (Gadde and Håkansson, 2001), there may, of course, exist cases where working principles flow downstream. However, no examples of this were found in the survey results.

Conclusions and suggestions for further research
Researchers as well as practitioners and the media often refer to different sourcing-related trends, but concrete data regarding these trends is scarce. The aim of this article has, therefore, been to provide quantitative facts regarding different sourcing trends and to compare the results with existing research. A survey was sent to car manufacturers and first tier suppliers. A majority of the 27 responses come from Europe, but also North American and Asian companies are represented.

Owing to the limited number of responses, precautions have been taken to carefully interpret the results. Further, the data was checked for geographical variations and, since the data was not normally distributed, more conservative (non-parametric) statistical methods have been used. Although the limited sample and the more conservative methods make it more difficult to detect small differences, the results help to further develop knowledge regarding sourcing related trends.

The findings give a picture of the sourcing-related trends that is somewhat different from the one found in the literature. Only three out of eight sourcing related trends were fully supported (see Table XI). The other five were only partially supported by either car manufacturers or first tier suppliers. Thus, the results show that what is perceived to be a general trend does not always reflect the actual situation.

One clear example is the level of outsourcing, which in the literature generally is said to be increasing. However, when measuring the degree of outsourcing as cost of purchased materials in relation to turnover, the survey results show that neither car manufacturers nor suppliers have increased their degree of outsourcing during the past decade. Further, in the near future (until 2003), only the suppliers plan to increase their outsourcing. When considering product development though, the picture is different. The results clearly show that suppliers will increase their share of total product development resources. At the same time, while keeping the level of purchased material constant, the use of JIT-deliveries is increasing over time. Thus, integrating these findings results in a picture of car manufacturers keeping the outsourcing of material around 60 per cent, while letting suppliers take more responsibility for development and assembly of systems and modules.

Taken together, the findings clearly show the importance of analyzing and questioning “trends”. Additional research is, however, needed to modulate the findings in this article, as well as to analyze other and new “trends”.
Furthermore, a “why” and “how” question is justified for each identified trend. For instance, why do car manufacturers focus more on product related services, and how do they intend to achieve this? Moreover, further research may focus on comparisons between different categories of suppliers and car manufacturers. This can, for instance, be based on geographical region, product complexity, etc. There is thus ample room for both additional surveys and case studies in order to shed more light on the “trends” in the car industry.

References


